

LISTING OF THE CLAIMS

The listing of claims set forth below will replace all prior versions and listings of claims in the application.

1. (Currently amended) A barrier operator for moving a barrier between open and closed positions with respect to a barrier opening, comprising:

a light pattern generator to project an optical light pattern onto a floor across the barrier opening, the light pattern being a single uninterrupted substantially straight line of light in the absence of an obstruction and being projected during at least a closing movement ~~all movements~~ of the barrier;

an imaging device configured to observe the floor across a portion of the barrier opening and to acquire an image of the line of light as illuminated by the optical pattern and detect an interruption in the line of light on the floor projected by the light pattern generator; and

a controller coupled to the imaging device to sense when the observed single uninterrupted substantially straight line of light in the observed portion of the barrier opening changes from a single substantially straight line, and generating a detection signal in response thereto, the detection signal being indicative of the presence of the obstruction at least during the closing movement ~~all movements~~ of the barrier and which detection signal effects at least a stopping or reversal of the closing movement of the barrier.

2. (Currently Amended) The barrier operator of claim 1, ~~comprising apparatus for periodically recording images detected by~~ wherein the imaging device is a single device which is configured to acquire an image of the line and detect an interruption of the line of light.

3-4. (Cancelled)

5. (Currently Amended) The barrier operator of claim 1, wherein the ~~digital imaging device~~ light pattern generator is configured to be mounted above and ~~observes the barrier path~~ at an angle to the barrier opening scanning device.
6. (Currently Amended) The barrier operator of claim 1, comprising an alarm device configured to generate an alarm indication in response to the detection signal.
7. (Original) The barrier operator of claim 6, wherein the alarm indication is an audible signal.
8. (Original) The barrier operator of claim 6 wherein the alarm indication is a visual signal.
9. (Original) The barrier operator of claim 1, comprising a barrier drive unit for moving the barrier, and wherein the controller is responsive to the detection signal to control the barrier drive.
10. (Original) The barrier operator of claim 1, wherein the light pattern generator comprises:
 - a source of electrical energy;
 - a laser diode; and
 - an optical lens to focus a beam generated by the laser diode.
11. (Original) The barrier operator of claim 1, wherein the imaging device is a CCD camera.
12. (Original) The barrier of claim 1, wherein the light pattern generator is disposed on the barrier.

13. (Original) The barrier operator of claim 1, comprising a head unit with a motor for moving the barrier, and the imaging device is disposed on the head unit.

14-17. (Cancelled)

18. (Currently amended) A method of detecting an object in a barrier opening for a defined area associated with a barrier which moves between open and closed positions, the method using a light pattern generator and a digital imaging device, comprising the steps of:
projecting from above a floor at the barrier opening and at an angle offset from a vertical plane formed by the barrier when it closes the opening a beam from the substantially linear line of light pattern generator onto the floor in the barrier opening across the defined area and producing a substantially linear line of light on the floor an optical pattern during at least a closing movement all movements of the barrier, the substantially linear line of light on the floor optical pattern being a single uninterrupted substantially straight line in the absence of an obstruction;
observing with a digital imaging device the optical pattern at an off-set angle to the linear line of light on the floor projected beam and to the vertical plane formed by the barrier when closed in the barrier opening;
storing in a memory an image of a non-obstruction pattern produced by projecting the pattern across the defined area in absence of an obstacle;
detecting with the digital imaging device whether there has been an interruption of the substantially linear line of light on the floor by the digital imaging device a present optical pattern;
periodically comparing the single substantially observed straight line with the stored image;
producing a control signal at least during the closing movement of the barrier when the observed single substantially straight line changes from a single substantially straight line stored in the memory as a result of the obstruction interrupting the uninterrupted substantially linear line of light in the barrier opening defined area the control signal being an effective indicator of a

~~presence of the obstruction in the defined area at least during all movements of the barrier and~~
which detection effects at least a stopping or reversal of the closing movement of the barrier.

19. (Original) The method of claim 18, comprising generating an alarm signal responsive to the control signal.

20. (Currently Amended) The method of claim 18, wherein the digital imaging device is at an angle offset from the vertical plane formed by the barrier when it closes the opening comprising controlling a movement of a barrier in the defined area in response to the control signal.

21. (Currently amended) A barrier operator for moving a barrier along a barrier path between open and closed positions in a barrier opening, the barrier operator comprising:

a light pattern generator configured to be above a floor in the opening and at an angle offset from a vertical plane formed by the barrier when it closes the barrier opening, wherein the light pattern generator is configured to project an optical beam across the barrier path during at least a closing movement all movements of the barrier to produce a projected single substantially straight line of uninterrupted light onto the floor in the absence of an obstruction;

an imaging device configured to observe the floor in the barrier path and acquire an image of the line of light as illuminated by the optical beam and to sense an interruption in the line projected by the light pattern generator; and

a controller coupled to the imaging device configured to effectively respond to the sensed interruption sense an in the acquired image of the line of light by an obstruction illuminated by the optical beam when the observed single substantially straight line changes at least during the closing movement all movements of the barrier and which response effects at least a stopping movement of the barrier without consulting a data structure stored in memory.

22-25. (Cancelled)

26. (New) A method of detecting an object in a barrier opening having a barrier controlled by an operator which moves the barrier between open and closed positions, the method comprising:

projecting a substantially linear line of light onto a floor in the barrier opening from above the floor and at an angle offset from a vertical plane formed by the barrier when it closes the barrier opening, and the projected line of light producing an uninterrupted substantially linear line of light on the floor in the absence of an obstruction during at least a closing movement of the barrier;

observing with a digital imaging device the substantially linear line of light on the floor;
sensing with the digital imaging device whether there has been an interruption of the substantially linear line of light on the floor; and

producing a control signal in response to a sensed interruption of the substantially linear line on the floor in the barrier opening at least during the closing movement of the barrier and which detection effects at least a stopping or reversal of the closing movement of the barrier without consulting data stored in a memory of the operator.

27. (New) The method of claim 26, wherein the digital imaging device is at an angle offset from the vertical plane formed by the barrier when it closes the opening.